STIN 1007

Issue 1.3
March 2026

Suppliers' Trial Information Note

For The Openreach Network

Fibre to the Premises (FTTP) Generic Ethernet Access on XGS-PON

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1. Service Outline

1.1 General

Openreach will provide the Generic Ethernet Access – Fibre to the Premises (GEA-FTTP) product, part of Openreach's Next Generation Access (NGA) portfolio, over a shared passive fibre optic infrastructure using ten gigabits symmetric – passive optical network (XGS-PON).

This Suppliers' Trial Information Note (STIN) provides details relevant to CPs regarding connectivity and interfaces.

It should be noted that the information contained within this STIN might be subject to change due to either the results of developments, or due to feedback from customers. Please check with the Suppliers' information notes site to ensure you have the latest version of this document.

1.2 Service Availability

GEA-FTTP will provide an 'always on' Virtual Local Area Network (VLAN) between the Optical Line Termination (OLT) equipment in a BT exchange and each XGS-PON Optical Network Termination (ONT) device in the End User (EU) premises. This 'VLAN' will be able to carry data communication signals after the CP has successfully ordered service for delivery to its End User(s).

GEA-FTTP will consist of:

- Physical network connectivity between the EU premises and the Openreach point of handover to CP networks (GEA 'lit fibre' circuit)
- A 'Data Port' Ethernet VLAN offering the following bandwidths in Mbit/s:

Product	Downstream Peak	Downstream Prioritised	Upstream Peak	Upstream Prioritised
GEA-FTTP 0.5/0.5	0.5	0.5	NA	0.5
GEA-FTTP 10/1	10	1	NA	1
GEA-FTTP 40/2	40	15	NA	2
GEA-FTTP 40/10	40	15	NA	10
GEA-FTTP 40/15	40	15	NA	15
GEA-FTTP 55/10	55	20	NA	10
GEA-FTTP 80/20	80	30	NA	20
GEA-FTTP 100/15	100	20	NA	15
GEA-FTTP 100/30	100	30	NA	30
GEA-FTTP 110/15	110	20	NA	15
GEA-FTTP 115/20	115	55	NA	20
GEA-FTTP 160/30	160	110	NA	30
GEA-FTTP 220/20	220	30	NA	20

GEA-FTTP 220/30	220	110	NA	30
GEA-FTTP 330/20	330	40	NA	20
GEA-FTTP 330/30	330	40	NA	30
GEA-FTTP 330/50	330	110	NA	50
GEA-FTTP 500/165	500	220	165	110
GEA-FTTP 550/75	550	110	75	50
GEA-FTTP 1000/115*	1000	110	115	50
GEA-FTTP 1000/220*	1000	330	220	110
GEA-FTTP 1000/1000*	1000	110	1000	50
GEA-FTTP 1200/120	1200	110	120	50
GEA-FTTP 1800/120	1800	110	120	50
GEA-FTTP 2500/250	2500	110	250	55
GEA-FTTP 2500/500	2500	110	500	55
GEA-FTTP 2500/2500	2500	110	2500	110
GEA-FTTP 3300/330	3300	110	330	55
GEA-FTTP 3300/660	3300	110	660	55
GEA-FTTP 3300/3300	3300	110	3300	110
GEA-FTTP 5500/550	5500	110	550	55
GEA-FTTP 5500/1100	5500	110	1100	55
GEA-FTTP 5500/5500	5500	110	5500	110
GEA_FTTP 8500/850	8600[†]	110	850	55
GEA-FTTP 8500/1700	8600[†]	110	1700	55
GEA-FTTP 8500/8500	8600[†]	110	8500	110

Table 1 – GEA-FTTP product rates

[†] The downstream rate has been optimised for greater throughput.

1.3 GEA Cablelink

The GEA Cablelink Product will be offered for the CP to order connectivity to the Layer 2 Switch (L2S) in the same Point of Handover building.

This will comprise:

- A Gigabit Ethernet (GE) port set to auto-negotiate, 1000Base-LX (Single Mode only); or
- A 10GE port set to 10000Base-LR (Single Mode only); and
- Fibre connection from the port on the L2S to the location within the same Point of Handover specified by the CP

CPs will need to specify as part of the ordering process the location of their equipment/presence to which the connection should be made.

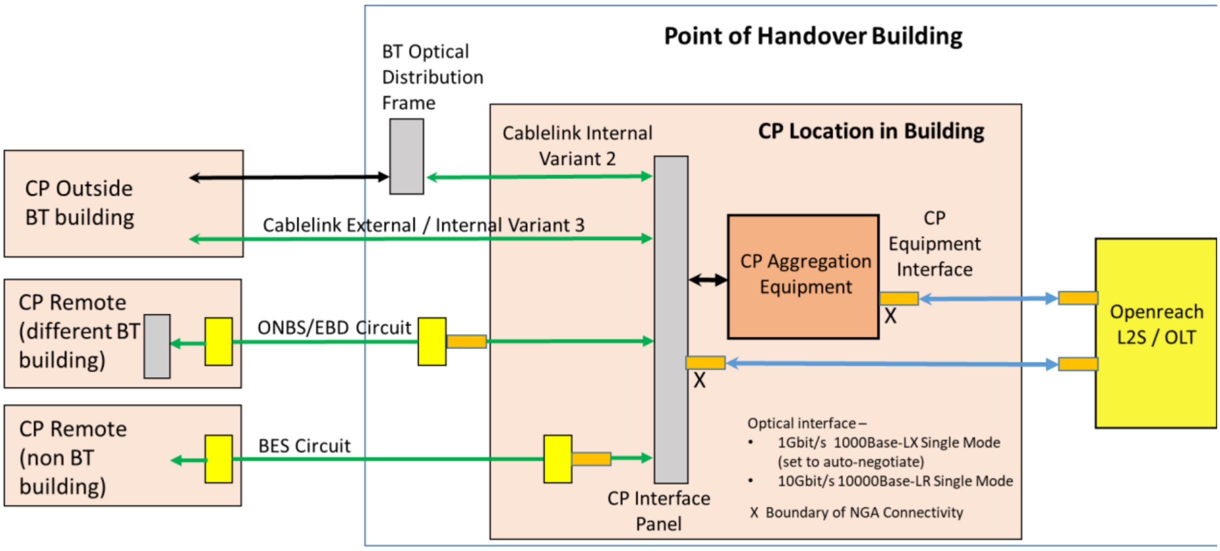
Point of Handover Building
BT Optical Distribution Frame
Cablelink Internal Variant 2
CP Location in Building
CP Outside BT building
Cablelink External / Internal Variant 3
CP Equipment Interface
CP Aggregation Equipment
X
CP Remote (different BT building)
ONBS/EBD Circuit
Openreach L2S / OLT
X
CP Remote (non BT building)
BES Circuit
Optical interface –
1Gbit/s 1000Base-LX Single Mode (set to auto-negotiate)
10Gbit/s 10000Base-LR Single Mode
CP Interface Panel
X Boundary of NGA Connectivity

Figure 1 – GEA Network and Connectivity Link

2. Interface Descriptions

2.1 GEA Cablelink

2.1.1 Physical connection

The identified interface option and location for the GEA Cablelink will need to be specified by the CP, either:

- CP owned and provided Interface Panel, or
- CP owned and provided equipment interface (Ethernet port).

The interface is the connector on the end of the Openreach fibre tail.

The following physical optical interface connector types only are supported for connection to the CP provided identified interface:

- Ferrule Connector (FC) / Physical Contact (PC)
- Lucent Connector (LC)
- Square Connector (SC)

Note - Angled connectors are NOT supported.

The physical interface must be specified on the order request. Any conversion of interfaces is the CP's responsibility, i.e. the CP must provide interface converters on its card or at the interface panel, if necessary. Openreach engineers must be provided with access to the identified interface point (whether that is an interface panel or the CP's actual interface card itself) for both fulfilment and assurance purposes.

GE and 10GE Single-Mode interfaces are described in SIN 360 [1].

Both GPON and XGS-PON based GEA-FTTP services can be provisioned on the same GEA Cablelink. More information about the GEA Cablelink product can be found in the GEA Cablelink Product Description on the Openreach Portal (see http://www.openreach.co.uk).

2.1.2 Ethernet frame size

The maximum supported Ethernet frame size is 1530 bytes (excluding Inter Frame Gap (IFG) and pre-amble).

2.1.3 VLAN Tagging Options at the GEA Cablelink for GEA-FTTP

2.1.3.1 Openreach added tags

On the GEA Cablelink, all traffic will be presented using single or double tagged on a per connection basis. Both options can be used on the same GEA Cablelink on a per GEA order basis. The tagging option to use for a specific GEA order is explicitly selected by the CP when ordering.

The VLAN used for EU traffic is referred to as a Customer VLAN or "C-VLAN".

A CP may optionally choose to use an additional level of VLAN tagging so that C-VLANs can be grouped within another VLAN, referred to as a Service VLAN or "S-VLAN".

- Single Tagged Handover
    - The Outer VLAN is the C-VLAN.
    - The Outer VLAN will carry the EU traffic and will have a tag in the range 2 to 3000 or 3071 to 4094[*]. Openreach will allocate the lowest available unused tag.
- Double Tagged Handover
    - The Outer VLAN is the S-VLAN, and the Inner VLAN is the C-VLAN.
    - Outer VLAN tag(s) must be requested via a Modify order against a GEA Cablelink (GEA Cablelink provision must be complete) before they can be used in a GEA order.
        - The Outer VLAN will have a tag in the range 2 to 3000 or 3071 to 4094.
            - The CP can specify the tag to be added; or
            - Openreach will allocate the lowest available unused tag if the CP does not specify the tag.
    - Where double tagging is required, the CP must include the Outer VLAN tag value in the GEA order.
    - The Inner VLAN will carry the EU traffic and will have a tag in the range 2 to 4094. Openreach will allocate the lowest available unused tag.

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[*] Please note, values between 3001 and 3070 are reserved for GEA Multicast.

2.1.3.2 CP added tags

For GEA-FTTP, CPs can optionally add tags in the downstream direction, and these will be transported transparently through to the EU CPE. These are denoted as 'X-VLANs'.

For GEA-FTTP, the EU CPE can add tags in the upstream direction and these will be transported transparently through to the CP, with the exception of tag 0 which will be removed by Openreach (see section 2.1.8 for more details).

2.1.4 Ethertype

The outermost VLAN Ethertype is configurable to 0x81-00 (default) or 0x88-A8 (as per IEEE802.1ad[4]. This applies to the GEA Cablelink as a whole and is irrespective of single or double tagging of the GEA services carried.

2.1.5 Downstream Priority Marking

2.1.5.1 GEA-FTTP Downstream Priority Marking

CPs can use the C-VLAN Priority Code Point (PCP) field [5] on downstream GEA-FTTP traffic on the Customer VLAN. The full range of PCP values 0-7 can be used by CPs to differentiate between downstream traffic classes.

In the event of congestion within the Openreach network, the markings will be used to identify which frames can be dropped first for a particular EU. PCP traffic marking is optional.

To allow Openreach to ensure that under congestion conditions traffic is discarded according to the CPs marking, with "can drop" traffic being dropped ahead of "should not drop" traffic, the following scheme will be used.

2.1.5.1.1 Per EU / Intra EU frame drop prioritisation

The C-VLAN PCP markings are used to identify the order in which traffic can be dropped.

- PCP = '1 to 7' = "Should Not Drop" (no drop priority differentiation between these four markings except on egress from the GPON port, and on the ONT LAN port)
- PCP = '0' = "Can Drop"

Where Double Tagging is used, the markings must be applied to the Inner C-VLAN.

The PCP field allows the CP to influence which frames are dropped first under congestion, thus allowing loss sensitive applications to have greater protection and at the same time allow best-efforts applications to benefit from full network capacity when it is available, but at the risk of frame loss. Openreach will remark the PCP field to ensure each EU has fair access to the available network capacity as follows:

- When an end-user's "Should not drop" marked traffic is supplied below the prioritised rate, then some of that end-user's "Can drop" frames will be arbitrarily promoted to "Should not drop" so that, if possible, the "Should not drop" traffic rate equals the prioritised rate.
- Where an end-user's traffic is marked "Should not drop" and exceeds the prioritised rate, then some of that end-user's frames will be arbitrarily demoted to "Can drop" so that the rate of "Should not drop" traffic equals the prioritised rate.

Therefore, for optimal performance the CP should ensure loss-sensitive traffic is marked "Should not drop" and kept within the prioritised rate of the end-user's service.

All Openreach VLANs are removed on egress from the ONT LAN port. Any additional 'X-VLAN' tags added by the CP remain in the downstream direction remain.

2.1.6 Downstream policing

Each individual GEA-FTTP connection is policed by Openreach on ingress to the GEA Cablelink to the product rate. The details of the policing rates and associated burst sizes are detailed in Table 2 below.

Product			Policing parameters			
Peak rate (Mbps)	Prioritised rate (Mbps)	Sub-Product	CIR (kbps)	CBS (B)	PIR (kbps)	PBS (B)
0.5	0.5	GEA-FTTP	512	16000	512	16000
10	1	GEA-FTTP	1000	16000	10000	36000
40	15	GEA-FTTP	15000	16000	40000	71000
55	20	GEA-FTTP	20000	16000	55000	83000
80	30	GEA-FTTP	30000	20000	80000	100000
100	20	GEA-FTTP	20000	16000	100000	112000
100	30	GEA-FTTP	30000	20000	100000	112000
110	20	GEA-FTTP	20000	16000	110000	118000
115	55	GEA-FTTP	55000	26000	115000	120000
120	55	GEA-FTTP	55000	26000	120000	123000
160	110	GEA-FTTP	110000	37000	160000	124000
220	30	GEA-FTTP	30000	20000	220000	124000
220	110	GEA-FTTP	110000	37000	220000	124000
330	40	GEA-FTTP	40000	22000	330000	124000
330	110	GEA-FTTP	110000	37000	330000	124000
500	220	GEA-FTTP	220000	52000	500000	124000
550	110	GEA-FTTP	110000	37000	550000	124000
1000	110	GEA-FTTP	110000	37000	1000000	124000

1000	330	GEA-FTTP	330000	64000	1000000	124000
1200	110	GEA-FTTP	110000	37000	1200000	388000
1800	110	GEA-FTTP	110000	37000	1800000	434000
2500	110	GEA-FTTP	110000	37000	2500000	560000
3300	110	GEA-FTTP	110000	37000	3300000	643000
5500	110	GEA-FFTP	110000	37000	5500000	838000
8500	110	GEA-FTTP	110000	37000	8600000[†]	1038000

Table 2 – GEA-FTTP downstream policing parameters

[†] The downstream rate has been optimised for greater throughput.

Please see Section 2.1.7 for notes on the maximum recommended burst size for traffic shaping into the Openreach network.

The policing behaviour is described below:

- If the CP sends a range of 802.1p marked traffic (0,1,2,3,4,5,6,7) for the GEA data service downstream to the GEA Cablelink, the following will be observed for bursts:
  - 802.1p = 0 marked traffic will have access to half of PBS
  - 802.1p = 1 to 7 marked traffic will have access to the full PBS
- If more than PIR is sent, then random drop across 802.1p = 0 and demoted 802.1p = 1 to 7 (i.e. the CP sent traffic marked as discard ineligible above the CIR rate) will be seen
- The policers act on the full packet, apart from the IFG & pre-amble i.e. VLAN tags, SA/DA, FCS

2.1.7 Downstream shaping

The CP is expected to shape the downstream traffic to match the product downstream rate (see section 2.1.6) to avoid excessive traffic loss.

Openreach further recommends that CPs limit the maximum burst size of their shaper to 124kB for downstream product bandwidths above 160Mbps to account for subtle differences vendor in equipment performance and buffer capacities. This is optional but will help optimise performance. Please refer to Table 2 above for the recommended burst sizes for each Openreach product.

The information above is for guidance only. Test facilities are available to help CPs test and optimise configuration if required. Please contact your Openreach representative for details.

2.1.8 Upstream priority marking

CPs can (optionally) prioritise upstream traffic from the CPE to the ONT by marking their traffic with IEEE 802.1p markings in a VLAN (referred to as the X VLAN within this document). The GEA-FTTP service over XGS PON supports eight upstream queues that are served in strict priority order

Queue	PCP markings
7	Highest priority, served first
6	6; served after queue 7 but before queue 5
5	5; served after queue 6 but before queue 4
4	4; served after queue 5 but before queue 3
3	3; served after queue 4 but before queue 2
2	2; served after queue 3 but before queue 1
1	1; served after queue 2 but before queue 0
0	0; Lowest priority, served last

Openreach recommend that CPs employ a PCP priority scheme which maps services of different priorities into separate queues to maintain service differentiation.

All Openreach VLANs will be marked with an 802.1p priority of 2 at the Cablelink handover.

Handling of the X VLAN tag varies.

- X VLAN ID = 0: VLAN tag is removed by the ONT (802.1p markings still used for prioritisation). VLAN 0 is not reinstated downstream by the ONT as shown in Figure 2
- X VLAN ID ≠ 0: VLAN tag will be forwarded to the CP (where this tag is forwarded, the CP must be able to handle this additional tag)

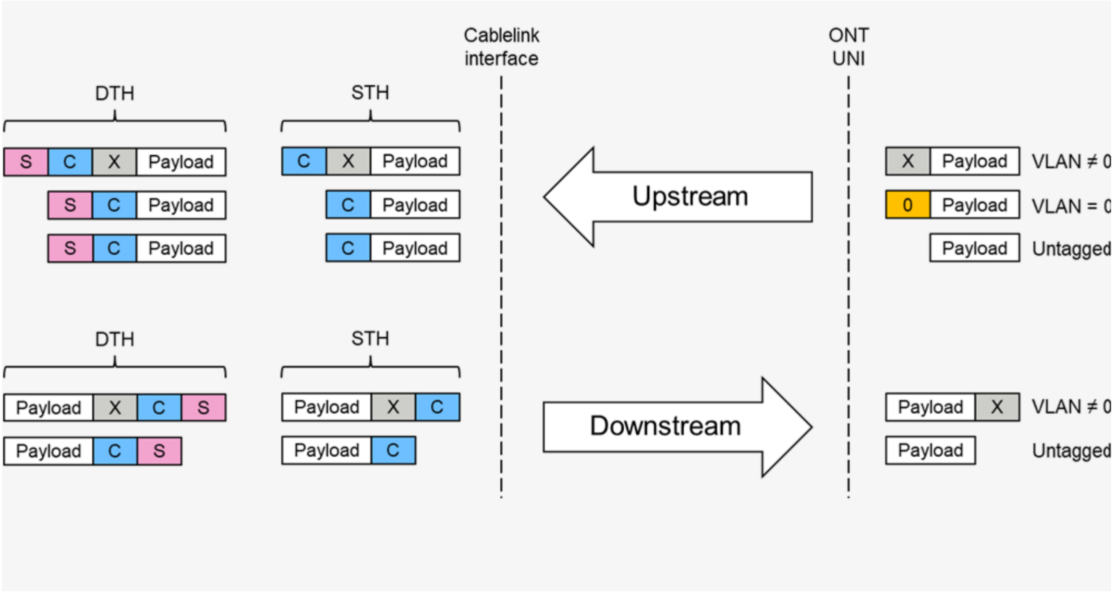


Figure 2 – Downstream and Upstream forwarding and Manipulation

2.1.9 Upstream shaping

The CP is expected to shape the upstream traffic to match the chosen upstream rate – see section 2.1.8.

In addition, the CP should consider the impact of upstream capacity on its GEA Cablelink.

Openreach will shape traffic into the GEA Cablelink. This shaping will treat all GEA-FTTP Data traffic equally. Specifically, it will not make use of any markings applied by the CPE.

Openreach will not explicitly manage traffic at an individual inner tag or outer tag level.

2.1.10 Intermediate Agent/DHCP Relay Agent

Where PPPoE is detected, additional tags will be inserted into the upstream flow (PADI) by the Intermediate Agent (IA) in the OLT. Any existing tags of the same type from the CPE will be overwritten. The IA tags will be removed by the OLT in the downstream direction (i.e. from the PADO, PADS messages).

Where DHCPv4 is detected, the OLT will insert Option 82 Agent information field into the upstream flow (DHCP Discover). The Option 82 field will be removed by the OLT in the downstream response (DHCP Offer).

The information inserted into PPPoE and DHCPv4 messages will be:

- Agent Remote ID – see below for format
- Agent Circuit ID – see below for format.

Where DHCPv6 is detected, the OLT may employ a Lightweight DHCPv6 Relay Agent (LDRA) at certain locations to insert Options 17, 18 and 37 into the upstream flow (e.g. DHCP Solicit):

- Option 17 'Vendor-specific Information": Includes sub-options for reporting line characteristics but will not include the line rate
- Option 18 'Interface-ID option': Used to identify the interface; similar to Agent Circuit ID
- Option 37 'Remote-ID option': Used to identify the client; equivalent to Agent Remote ID.

Speed information will not be inserted for DCHPv4, DHCPv6 or PPPoE for FTTP circuits. Access loop encapsulation information (sub-option 0x90) may be inserted on certain circuits but is not formally supported by Openreach and should therefore not be relied upon for FTTP.

The Option fields will be removed by the OLT in the downstream response (e.g. DHCP Offer).

The following information will be supplied.

Note - any information in these fields from the EU will be over-written:

- **Agent Remote ID** – 63-character field – value is either

    - Value supplied by CP during provide / modify
        - From character set – a~z A~Z 0~9 @ . _ - ( ) / + : (Note space character is NOT supported)
        - Invalid characters in the order will cause order rejection

or

    - DeviceName/S VLAN ID/Frame No_Slot No_Port No/uservlan/C VLAN ID if the CP does not set a value to be used
        - Changes if the port is changed for any reason – cannot be guaranteed to be constant
        - Any value supplied from any modem will be over-written
- **Agent Circuit ID** – format depends on the vendor:

ent-Circuit-ID format	Sample
ess-Node-Identifier eth rack/frame/slot/port/onu/onuslt/uni	BAAHKB eth 1/1/16/01/3/10/1
ess-Node-Identifier xpon frame/slot/port:ontid.vlanid	BAALHQ-OLT7 xpon 0/0/42:0.4

Table 3 – Agent Circuit ID formats

In all cases the “frame/slot/port” value may change if the port used is changed e.g. after a port failure.

2.1.10.1 DHCPv4/v6 Port Numbers

The expected UDP port numbers in the DHCP messages are detailed in the table below:

cenario	Expected Destination MAC address towards server	UDP Port numbers towards ONT	UDP Port numbers fro ONT
HCPv4	Broadcast	Dst: 67, Src: 68	Dst: 68, Src: 67
HCPv6	Multicast	Dst: 546, Src: 547	Dst: 547, Src: 546
HCPv4 L2 Relay	Broadcast	Dst: 67, Src: 68	Dst: 68, Src: 67
HCPv4 L3 Relay	Unicast	Dst: 67, Src: 67	Dst: 67, Src: 67
HCPv6 L2 Relay	Multicast	Dst: 546, Src: 547	Dst: 547, Src: 546
HCPv6 L3 Relay	Unicast	Dst:547, Src: 547	Dst:547, Src: 547

Table 4 – UDP port numbers for DHCP

The use of other UDP port numbers may result in the DHCP packets being silently discarded by the Openreach network.

2.1.10.2 Inverted DHCP/PPPoE

The scenarios shown in the diagram below, where a DHCP Server or BRAS is located at an EUs premises served by FTTC or FTTP are not currently supported by the GEA Data service. This may result in dropped session initiation frames and will result in the below scenarios not being able to successfully operate.

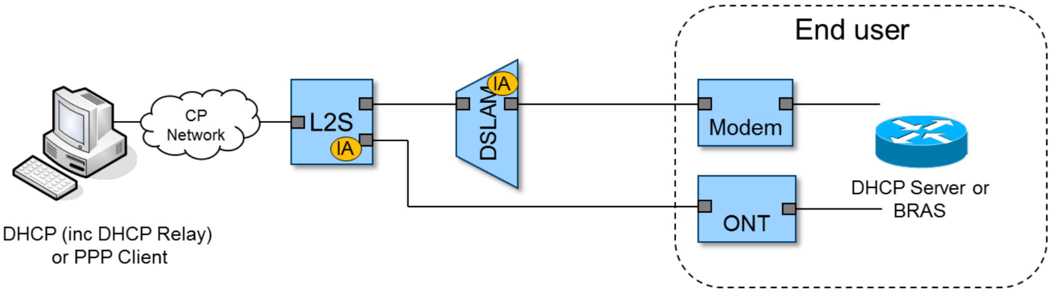


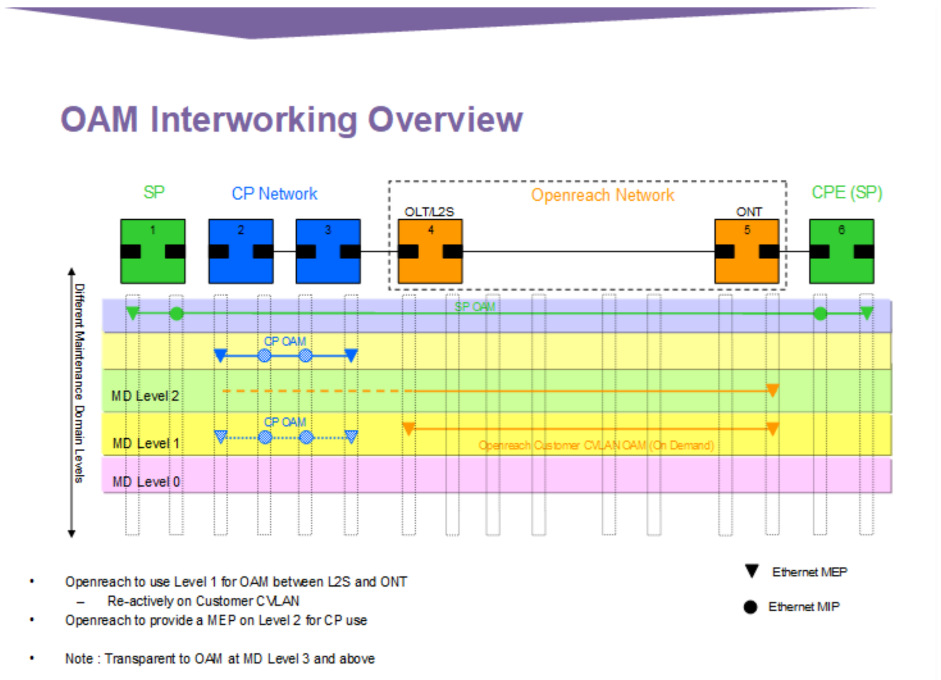
Figure 3 – Inverted DHCP/PPPoE

2.1.11 Ethernet OAM

CPs can send Ethernet OAM information end-to-end across their GEA-FTTP connection at MD Levels 3 and above.

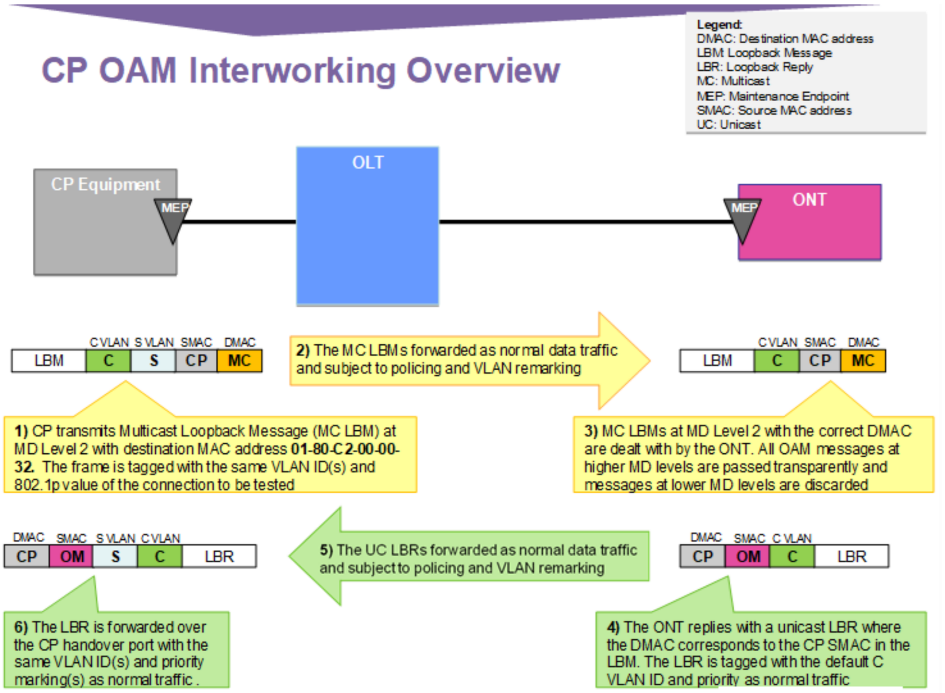
CPs can also test their GEA-FTTP circuits end-to-end between the CP's equipment and the ONT. To do this CPs must use Multicast Loopback Messages (MC LBMs) as described in ITU-T Y.1731[8] at MD Level 2 with a destination MAC address of 01-80-C2-00-00-32. The MC LBMs must be transmitted at a maximum rate of 1fps.

Working overview of OAM as follows:


OAM Interworking Overview

SP
CP Network
Openreach Network
CPE (SP)
OLT/L2S
ONT
1
2
3
4
5
6
SP OAM
CP OAM
MD Level 2
CP OAM
MD Level 1
Openreach Customer CVLAN OAM (On Demand)
MD Level 0
Different Maintenance Domain Levels
▼ Ethernet MEP
● Ethernet MIP

- Openreach to use Level 1 for OAM between L2S and ONT
  - Re-actively on Customer CVLAN
- Openreach to provide a MEP on Level 2 for CP use
- Note : Transparent to OAM at MD Level 3 and above


CP OAM Interworking Overview

Legend:
DMAC: Destination MAC address
LBM: Loopback Message
LBR: Loopback Reply
MC: Multicast
MEP: Maintenance Endpoint
SMAC: Source MAC address
UC: Unicast

CP Equipment
MEP
OLT
ONT
MEP
CVLAN SVLAN SMAC DMAC
LBM C S CP MC
CVLAN SMAC DMAC
LBM C CP MC
DMAC SMAC SVLAN CVLAN
CP OM S C LBR
DMAC SMAC CVLAN
CP OM C LBR

1) CP transmits Multicast Loopback Message (MC LBM) at MD Level 2 with destination MAC address **01-80-C2-00-00-32.** The frame is tagged with the same VLAN ID(s) and 802.1p value of the connection to be tested

2) The MC LBMs forwarded as normal data traffic and subject to policing and VLAN remarking

3) MC LBMs at MD Level 2 with the correct DMAC are dealt with by the ONT. All OAM messages at higher MD levels are passed transparently and messages at lower MD levels are discarded

4) The ONT replies with a unicast LBR where the DMAC corresponds to the CP SMAC in the LBM. The LBR is tagged with the default C VLAN ID and priority as normal traffic

5) The UC LBRs forwarded as normal data traffic and subject to policing and VLAN remarking

6) The LBR is forwarded over the CP handover port with the same VLAN ID(s) and priority marking(s) as normal traffic .

2.1.12 Transparency

GEA-FTTP will be transparent to all valid Ethernet frames except:

- 802.3x PAUSE [6] - Local link flow control protocol
- Slow Protocols - Set of protocols that includes LACP and 802.3ah OAM
- 802.1X Authentication [7] - Authentication protocol

- Physical layer signalling such as auto-negotiation

2.1.13 Frame duplication

CP equipment must observe Ethernet bridging rules. In particular, frames sent from Openreach to the CP must not be reflected back to the Openreach network with source MAC unaltered.

2.1.14 Multicast IP Group Addresses

Since the multicast MAC address is derived from the IP group address, CPs shall ensure that IP group addresses are unique in the lower 23 bits.

2.2 ONT Technical Specification

This section details the various indoor XGS-PON ONTs provided and supported by Openreach.

2.2.1 Nokia

Openreach employs the Nokia G-101X-Q XGS-PON ONT.

The Nokia ONT has a single 10000Base-T Ethernet data interface. It has a built-in layer-2 switch which supports data transfer at wire-speed for all packet sizes.

The technical specification of the interface connections provided by the ONT device are described in SIN 360 – Ethernet Customer Interfaces, Interface Characteristics [1].

2.2.2 Adtran

Openreach employs the Adtran SDX631 XGS-PON ONT.

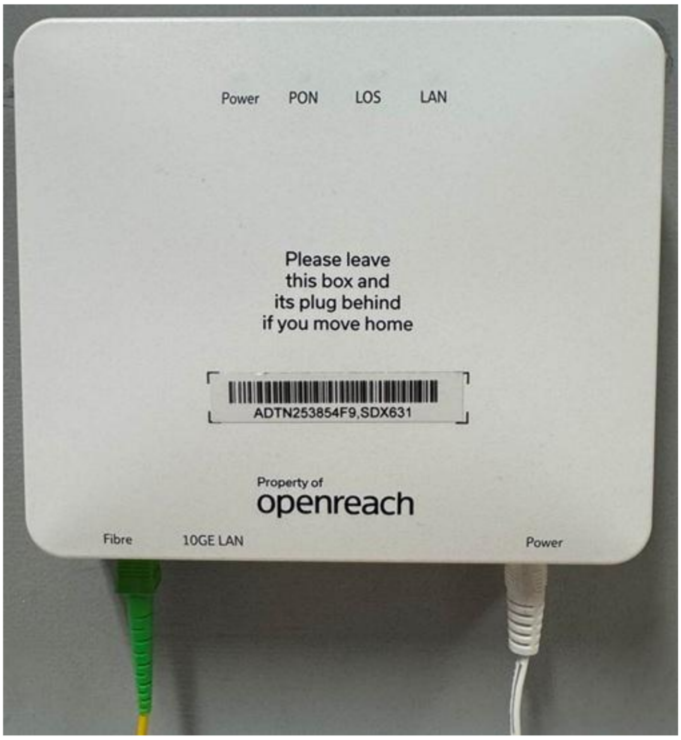

Power
PON
LOS
LAN
Please leave
this box and
its plug behind
if you move home
ADTN253854F9,SDX631
Property of
openreach
Fibre
10GE LAN
Power

Figure 4 – Adtran SDX631 ONT

The Adtran ONT has a single 10000Base-T Ethernet data interface. It has a built-in layer-2 switch which supports data transfer at wire-speed for all packet sizes.

The technical specification of the interface connections provided by the ONT device for Ethernet physical interfaces are described in SIN 360 – Ethernet Customer Interfaces, Interface Characteristics.

2.2.3 Dimensions

Attribute	Nokia G-010G010X-Q	Adtran SDX631
Height	135mm	88mm
Width	135mm	110mm
Depth	30mm	36mm
Screw Mount	60mm	60mm (TBC)

Table 5 – ONT dimensions

2.2.4 Interfaces

Vendor	Power port	On/off switch	LAN port	Optical port	Phone port	Reset button	USB port	BBU interface
Nokia	Yes	Yes	Yes	Yes	No	Yes	No	No
Adtran	Yes	Yes	Yes	Yes	No	Yes	No	No

Table 6 – Interfaces included on the ONTs referenced in this document

2.2.5 LEDs

Behaviour	POWER	PON	LOS	LAN
OFF	Power Off	No Optical Signal or Failed Auth	Optical Link Active	LAN Disconnected
FLASHING	Device Starting	Optical Signal Present and Authenticating	Firmware Update Failure	LAN Traffic Flowing
ON	Power On	Optical Link Active and Authenticated	No Optical Signal or Authentication Failed	LAN Connected

Table 7– ONT LED behaviour

2.2.6 Power Supply

The power supply will be a single, low voltage power interface. The PSU will be suitable for use with standard domestic UK supplied 230V (AC).

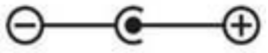
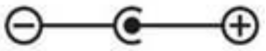
ONT type	ONT DC power specifications	DC connector type and dimensions
Nokia (G-010X-Q)	Input: 12V, 1A Max. ONT power consumption: 8.6W	Barrel connector, Centre positive 
Adtran SDX631	Input: 12V, 1A Max. ONT power consumption: 10W	Barrel connector, Centre positive 

Table 8 – Power supply information

2.2.7 Electrical Safety

The ONT is compliant with BS EN 60950-1 “Information technology equipment. Safety. General requirements”: http://www.bsigroup.com.

2.2.8 ONT Housing

The ONT will be fixed to a wall within 1m of a fixed power socket.

3. References

[1]	SIN 360	Ethernet Customer Interfaces, Interface Characteristics.
[2]	SIN 351	BT Public Switched Telephone Network (PSTN): Technical Characteristics Of The Single Analogue Line Interface
[3]	ND1646	ND1646 NGA-Telephony; Management V1.1.1 http://www.niccstandards.org.uk/publications/index.cfm
[4]	IEEE 802.1ad	Virtual Bridged Local Area Networks, Amendment 4: Provider Bridges
[5]	802.1D-2004	IEEE Standard for Local and metropolitan area networks - Media Access Control (MAC) Bridges
[6]	802.3x	Flow Control
[7]	802.1x	Port Based Network Access Control
[8]	ITU-T Y.1731	OAM functions and mechanisms for Ethernet based networks
[9]	IEEE 802.1Q	Bridges and Bridged Networks

4. Abbreviations

ATA	Analogue Telephone Adaptor
BES	Backhaul Extension Service
BS EN	British Standards – English
CP	Communications Provider
CPE	Customer Premises Equipment
CVLAN	Customer VLAN
DHCP	Dynamic Host Configuration Protocol
DLM	Dynamic Line Management
DSCP	Differentiated Services Code Point
DSL	Digital Subscriber Line
DSLAM	Digital Subscriber Line Access Multiplexer
EBD	Ethernet Backhaul Direct

EU	End User
FC/PC	Fixed Connection – fibre optic connector
FTTP	Fibre To The Premise
FVA	Fibre Voice Access
GEA	Generic Ethernet Access
ID	Identifier
IEEE	Institute of Electrical and Electronics Engineers
IEEE 802.1p	3 bit field within a VLAN used to indicate priority
IFG	Inter-Frame Gap
L2S	Layer 2 Switch
LC	Local/Lucent Connector
MDI/MDIX	Medium Independent interface (cross-over) – Ethernet port connection
NGA	Next Generation Access
NTE	Network Termination Equipment
OAM	Operations, Administration, Maintenance
OLT	Optical Line Termination
ONBS	Openreach Network Backhaul Service
ONT	Optical Network Termination device
PADI	PPPoE Active Discovery Initiation
PADO	PPPoE Active Discovery Offer
PADS	PPPoE Active Discovery Session- confirmation
PCP	Priority Code Point aka 802.1p priority
PSU	Power Supply Unit
PPM	Parts Per Million (Clock Accuracy)
PPPoE	Point to Point Protocol over Ethernet
QoS	Quality of Service
SC	Standard Connector
SIN	Suppliers' Information Note (BT Publication)
STIN	Suppliers' Trial Information Note (BT Publication)
VLAN	Virtual Local Area Network
SVLAN	Service VLAN

5. History

Issue	Date	Changes
1.0	April 2025	Date of first issue
1.1	Nov 2025	Added 5.5G and 8.5G products
1.2	Dec 2025	Corrected typo in Table 1
1.3	March 2026	Minor Changes

<END>